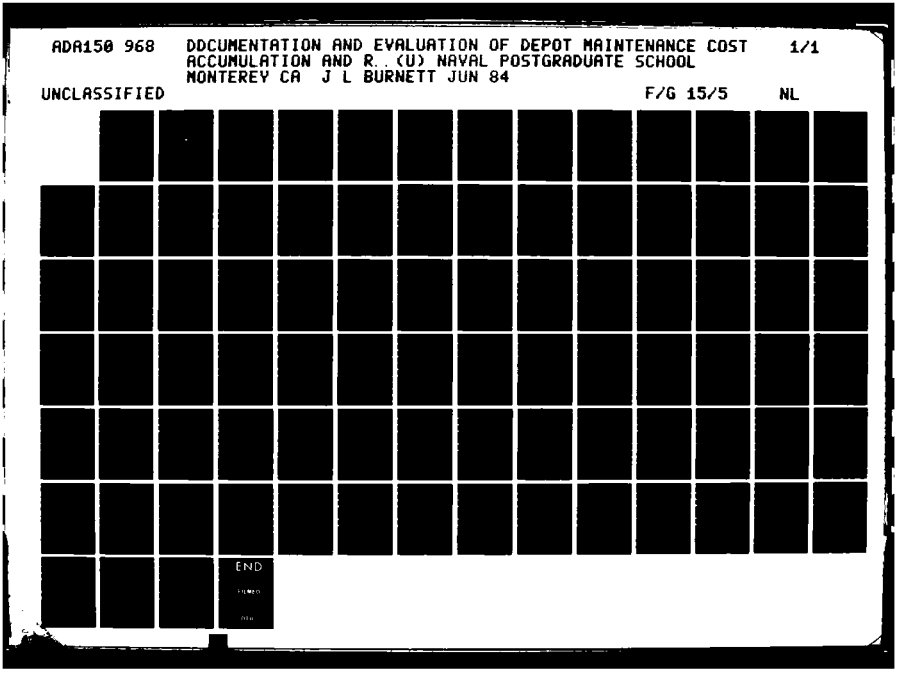
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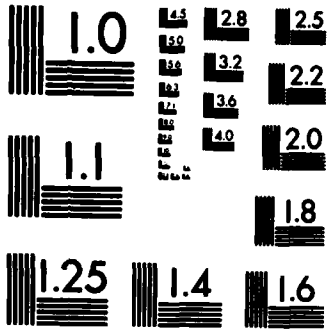

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

DOCUMENTATION AND EVALUATION OF DEPOT MAINTENANCE COST ACCUMULATION AND REPORTING AT THE NAVAL AIR REWORK FACILITY, JACKSONVILLE, FLORIDA

by

Joseph Lawrence Burnett

June 1984

Thesis Co-advisors: K. Euske
S. Ansari

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Documentation and Evaluation of Depot Maintenance Cost Accumulation and Reporting at the Naval Air Rework Facility, Jacksonville, Florida	5. TYPE OF REPORT & PERIOD COVERED: Master's Thesis; June 1984
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Joseph Lawrence Burnett	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93943	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93943	12. REPORT DATE: June 1984 / 13. NUMBER OF PAGES: 84
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report) / 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Depot Maintenance, Depot Level Maintenance, Naval Air Rework Facility, Uniform Cost Accounting, Uniform Depot Maintenance Accounting, Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

~~The purpose of this research project was to~~ examines the recording and reporting of depot level maintenance costs to the Office of the Assistant Secretary of Defense for Manpower, Installations and Logistics (OASD, MI&L) and the interpretation of these costs in OASD report RCS DD-M(A) 1397.

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Block 20 DD 1473

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Documentation and Evaluation of Depot Maintenance Cost Accumulation and Reporting at the Naval Air Rework Facility, Jacksonville, Florida

by

Joseph Lawrence Burnett
Lieutenant Commander, United States Navy
B.S., Georgia Southern College, 1972
M.S.,University of Southern California, 1979

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
June 1984

Author: Joseph L Burnett

Approved by: _____
Thesis Co-advisor

_____
Thesis Co-advisor

Richard S. Elster
Chairman, Department of Administrative Sciences

Kneale T. Marshall
Dean of Information and Policy Sciences

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I. INTRODUCTION

A. THESIS OBJECTIVE

The purpose of this research project is to examine and document the cost accounting and reporting systems used by the Navy in its system of Naval Air Rework Facilities (NARFs) and to gain an understanding of the degree to which the data collected by these systems fulfills the requirements of Department of Defense (DoD) uniform cost accounting as set forth in the Cost Accounting and Production Reporting Handbook. During meetings with representatives of the Office of the Assistant Secretary of Defense (Manpower, Installations and Logistics), the usefulness and accuracy of one of the reports produced from information collected by the system, OASD Report RCS DD-M(A) 1397, was discussed. As a result of these discussions, the decision was made to use this report as a basis for further investigation of the collection system, the data and its method of presentation.

B. HISTORY OF THE PROBLEM

The fact that no uniform cost accounting system is in use among the services has stimulated studies by several government agencies. Studies in May, 1978 and April, 1981 by the General Accounting Office (GAO) and the Defense Audit Service (DAS) respectively, have pointed out that DoD has attempted, since as early as 1963, to establish a cost

accounting and reporting system which would apply to all service depot level maintenance activities. A uniform system is deemed necessary due to the wide variety of accounting practices and procedures in use not only across service lines, but also within the individual services themselves and because the aggregated costs for repair, overhaul and maintenance activities were not meaningful. In 1972, the Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics (now Manpower, Installations and Logistics) chartered the Joint Logistics Commanders (JLC) panel, whose purpose was to develop and promulgate a uniform depot maintenance cost accounting manual. The fruits of this panel's efforts were published under the auspices of the OASD (Management Systems) as DoD Instruction 7220.29 "Guidance for Cost Accounting and Reporting for Depot Maintenance and Maintenance Support", October 20, 1975 and 7220.29-H "Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook", October 21, 1975. The target date for implementation of this new system was October 1, 1976 (General Accounting Office, May 1979). Specifically, the objectives of the new system were stated as follows:

1. To establish a uniform cost accounting system for use in accumulating the costs of depot maintenance activities as they relate to the weapon systems supported or items maintained. This information would enable managers to compare unit repair costs with replacement cost.

2. To assure uniform recording, accumulating and reporting on depot maintenance operations and maintenance support activities so that comparison of repair costs can be made between depots and between depots and contract sources performing similar maintenance functions.

3. To assist in measuring productivity, developing performance and cost standards and determining areas for management emphasis, which would enable managers to evaluate depot maintenance and maintenance support activities for efficient resource use.

4. To provide a means of identifying maintenance capability and duplication of capacity and indicating both actual and potential areas for interservice support of maintenance workload. (General Accounting Office, May 1979)

Despite these significant efforts to develop a viable system, discrepancies in reporting still exist and to date, the system is not fully implemented by any of the services. Costs continue to be identified and accounted for on differing bases among and between depots of the services and instances of non-compliance with directives because of long-standing differences between the services and DoD concerning accounting practices have resulted in significant errors in data reported to OASD (C). (Defense Audit Service, April 1981)

Currently, efforts to speed the installation and acceptance of a uniform cost accounting system are continuing. The JLC panel has established the Joint Depot Maintenance Analysis Group (JDMAG) whose goal is to assure the elimination or explanation of costing inconsistencies between the services. The JLC Aeronautical Depot Maintenance Study

Panel established an ad hoc group to monitor the implementation of DoD Instruction 7220.29-H and to attempt resolution of service differences with DoD guidance. During the period of its existence the group identified twenty-eight basic accounting areas of disagreement and recommended ninety-five changes to the handbook. The group used the Joint Interpretive Issuance (JII) as the vehicle with which to address the problem areas that it had discovered and to express its opinions and recommendations. Through its close coordination with the OASD (C), the group was effective in reconciling these problematic differences. The temporary charter for the ad hoc group lapsed in December, 1979 and in spite of its effectiveness, as late as April, 1981, eighteen areas of DoD guidance had not been fully implemented by one or more of the services. In March 1980 another group, the JLC Aeronautical Depot Maintenance Action Group (JADMAG), was formed under permanent charter and continues to study the problems at hand (Defense Audit Service, April 1981).

This report presents a case study of the status of depot cost reporting as it currently operates within the specific context of Naval Aviation rework at the Naval Air Rework Facility, Jacksonville, Florida. I begin by addressing the environmental and organizational background of NARF Jacksonville in order to describe, in a broad sense, the concept of depot level maintenance and how it is accomplished, recorded and reported. The next step documents the production

flow of each major program conducted at the NARF and examines how costs are accumulated to these programs as the rework process is accomplished. I then examine the resulting cost data in light of existing Department of the Navy reporting requirements as well as those requirements established by DoD 7220.29-H. A comparative analysis of cost data as reported by other NARFs for the repair of like items is also attempted. The last section presents the major findings and conclusions of the study and offers recommendations for solving specific problems.

The results of this study and other concurrent studies at the Sacramento Air Logistics Center, Sacramento, California and the Sacramento Army Depot, Sacramento, California are part of a larger study to evaluate depot level cost reporting to OASD.

II. DEPOT MAINTENANCE IN THE NARF SYSTEM

A. SCOPE AND MANAGEMENT OF NARF DEPOT MAINTENANCE

OPNAVINST 4790.2B, the Naval Aviation Maintenance Program (NAMP), is a primary source of guidance for facilities performing depot level maintenance on naval aircraft, their weapons systems and associated support equipment. The following is summarized from pertinent areas of the NAMP to provide a basic understanding of the mission of a Naval Air Rework Facility. Aviation depot level maintenance is defined in volume 4 of the NAMP as that maintenance performed on material that requires rework or complete rebuilding of its parts, assemblies, subassemblies and end items. If required, depot level maintenance also includes manufacturing of parts, material modification, testing and reclamation. Depot maintenance supports Organizational (O) and Intermediate (I) levels of maintenance by providing technical assistance and performing maintenance which is beyond O and I level responsibility or capability. Depot maintenance and support services are performed in industrial type facilities which may be government owned and government operated (GOGO) or, in support of government commercial and industrial (C/I) programs, may be owned by the government and operated by contractor personnel (GOCO) or completely owned and operated by a government contractor (COCO). The maintenance performed at these activities is categorized into several major programs:

1. airframe rework under the Standard Depot Level Maintenance (SDLM) concept.

2. modification of airframes, engines and aircraft components and systems.

3. repair and update of engines.

4. repair and overhaul of aircraft components and systems.

5. manufacturing of designated aeronautical parts, including the design and fabrication of change kits for authorized aeronautical equipment modification.

6. aircraft support service functions, such as overhaul and repair of Ground Support Equipment (GSE), calibration of test equipment, salvage and others.

7. other programs which include shipboard work, missile component repair, installation of capital equipment, and Navy engineering support.

The overall responsibility for the management of aviation depot maintenance activities, including the C/I program, has been delegated to the Chief of Naval Material (CNM) by the Chief of Naval Operations (CNO). Supported by the Deputy Chief of Naval Material (Operations and Logistics) and the Naval Material Industrial Resources Office (NAVMIRO), CNM publishes policies and procedures concerning the operation of the program within the Department of the Navy (DON). The Naval Air Systems Command (NAVAIRSYSCOM) is responsible to CNM to plan for the use of resources in the conduct of depot maintenance activities, to budget for its accomplishment, except in cases where funds are provided from other resource sponsors, and to oversee its performance. The Commander, Naval Air Logistics Center (NALC) is responsible to NAVAIR for the actual implementation, coordination, management,

control and administration of Navy-wide aviation depot maintenance programs. The Depot Management Directorate at the NALC serves as the manager of the Aviation Depot Level Maintenance Program and of the NARFs. As program manager, some of the Depot Directorates' functions include maintaining a five-year planning and programming system, preparation of the depot maintenance input for POM submission, preparation and justification of the aircraft rework and Industrial Plant Equipment (IPE) budgets, determining source assignments, making workload assignments and monitoring the performance of Navy facilities, commercial contractors and other services who accomplish Navy aviation depot maintenance. The last level in the responsibility hierarchy rests with the NARFs themselves. Figures 2.1 and 2.2 are graphic depictions of the command and responsibility relationships as they currently exist (OPNAVINST 4790.2B, 1981). According to the NARF Jacksonville Management Controls Director, changes in responsibilities at the NAVAIR/NALC level are in the early stages of implementation. These changes are intended to result in NAVAIR becoming responsible for the development of depot repair policy, and NALC assuming the primary duties of policy implementation and execution (Barilla, 1984).

B. NARF JACKSONVILLE

1. Activities and Services

NARF Jacksonville is one of the six industrially funded maintenance facilities which comprise the Naval Air

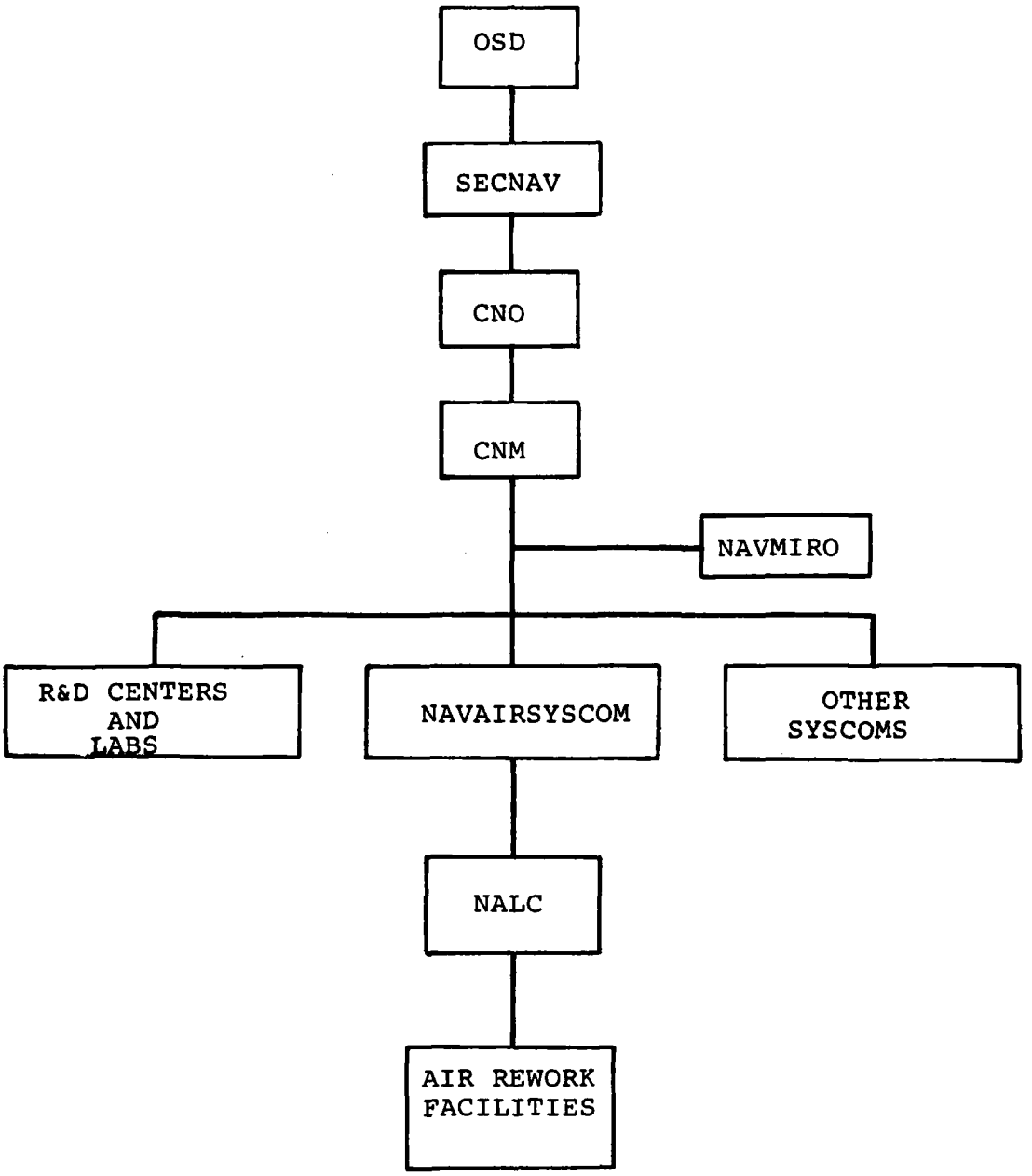


Figure 2.1: Naval Air Rework Command Hierarchy

Source: Adapted from OPNAVINST 4790.2B of 1 July, 1979

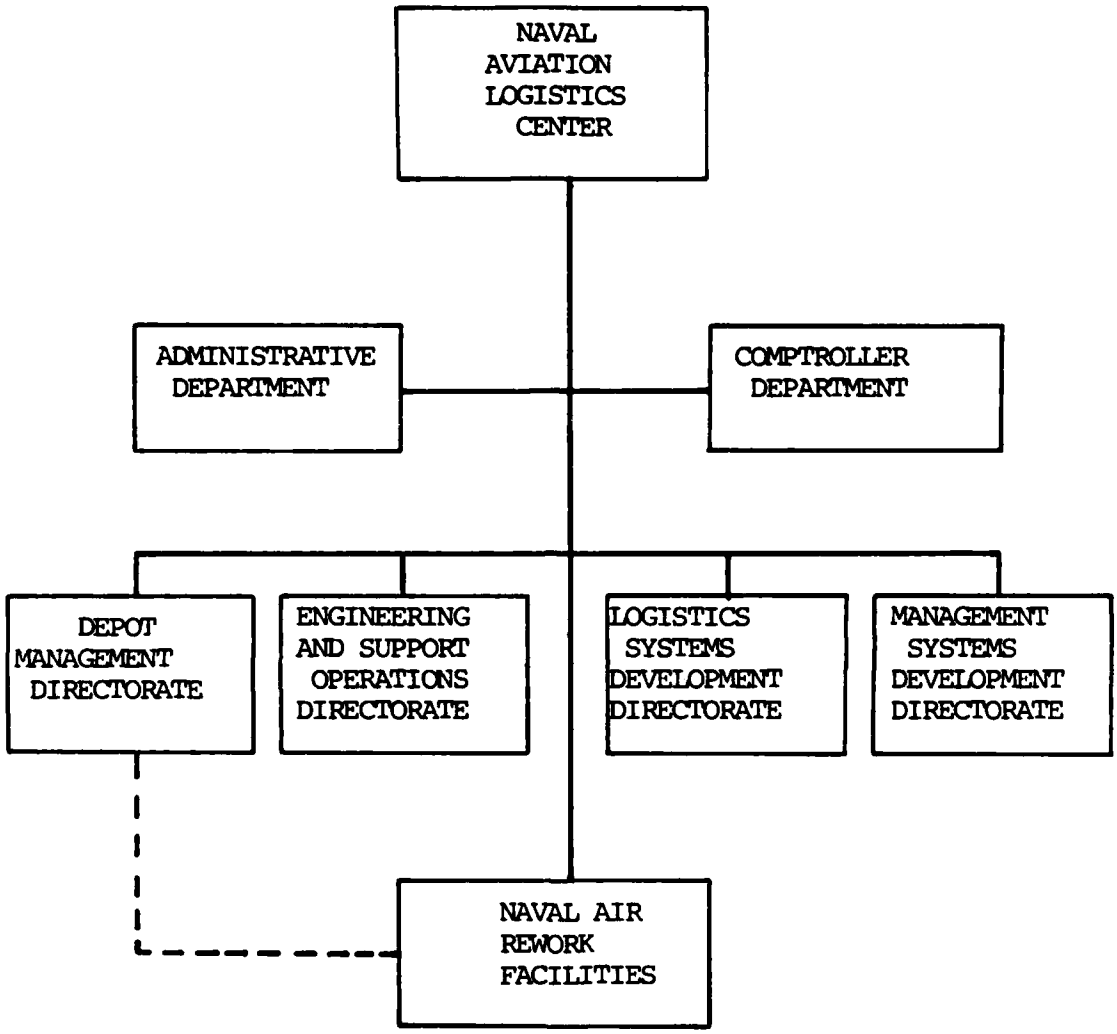


Figure 2.2: Naval Aviation Logistics Center Command Relationships.

Source: Adapted from OPNAVINST 4790.2B of 1 July, 1979.

Rework System. The facility is housed in some fifty buildings covering approximately 100 acres concentrated primarily on the eastern side of Naval Air Station (NAS) Jacksonville. NARF Jacksonville is staffed and operated by 27 military personnel and approximately 3300 government civilian employees, including a direct labor force of approximately 1700, making it the largest industrial employer in northeastern Florida (Command Presentation, 1984).

The facility began operation in the early 1940s as the Assembly and Repair Department of NAS Jacksonville and its first aircraft overhauls were performed on fabric covered Stearman biplanes. Since that time, the NARF has kept pace with the technological advancements made in Naval Aviation by installing modern numerically controlled machines and grinders, electron beam welders and computer driven automatic test equipment. A new final finish facility capable of housing several aircraft so that painting operations can be performed on all of them simultaneously has been built. A more modern and efficient plating and cleaning facility is under construction. There are also plans to build an acoustically isolated test cell which will completely contain all noise generated by jet engines within the test cell. This facility will enable the NARF to conduct full power post maintenance turn-ups on engines at any time of day or night without disturbing the surrounding area (Command Presentation, 1984). The plant and equipment currently in

use are valued at approximately 95.5 million dollars (Navy Industrial Fund Financial and Cost Statements, 1984).

The depot repair activities performed at NARF Jacksonville are classified by maintenance programs and support programs. Major maintenance programs under way at this time include A-7/P-3 SDLM, a variety of engine programs and a large components repair program. Support programs consist of test equipment and GSE repair, engineering and technical assistance, analytical rework and training.

2. Organization

The management structure in place at NARF Jacksonville is established along the functional lines of production activity and support activity (Figure 2.3). The structure, as described in the command organizational manual (NARFJAXINST 5451.1C), contains a mix of both military and government civilian managerial personnel. The first level of organization is the command element. The next level, Top Management, includes department supervision. Departments may be subdivided into divisions, branches, sections, and units or shops. The Top Management level is further broken down and contains military billets at a management level above the department level. The officers who occupy these positions report directly to the Command Element. The Command Element expects these officers to provide close coordination and control over the functions under their purview and to provide expert assistance and advice to the

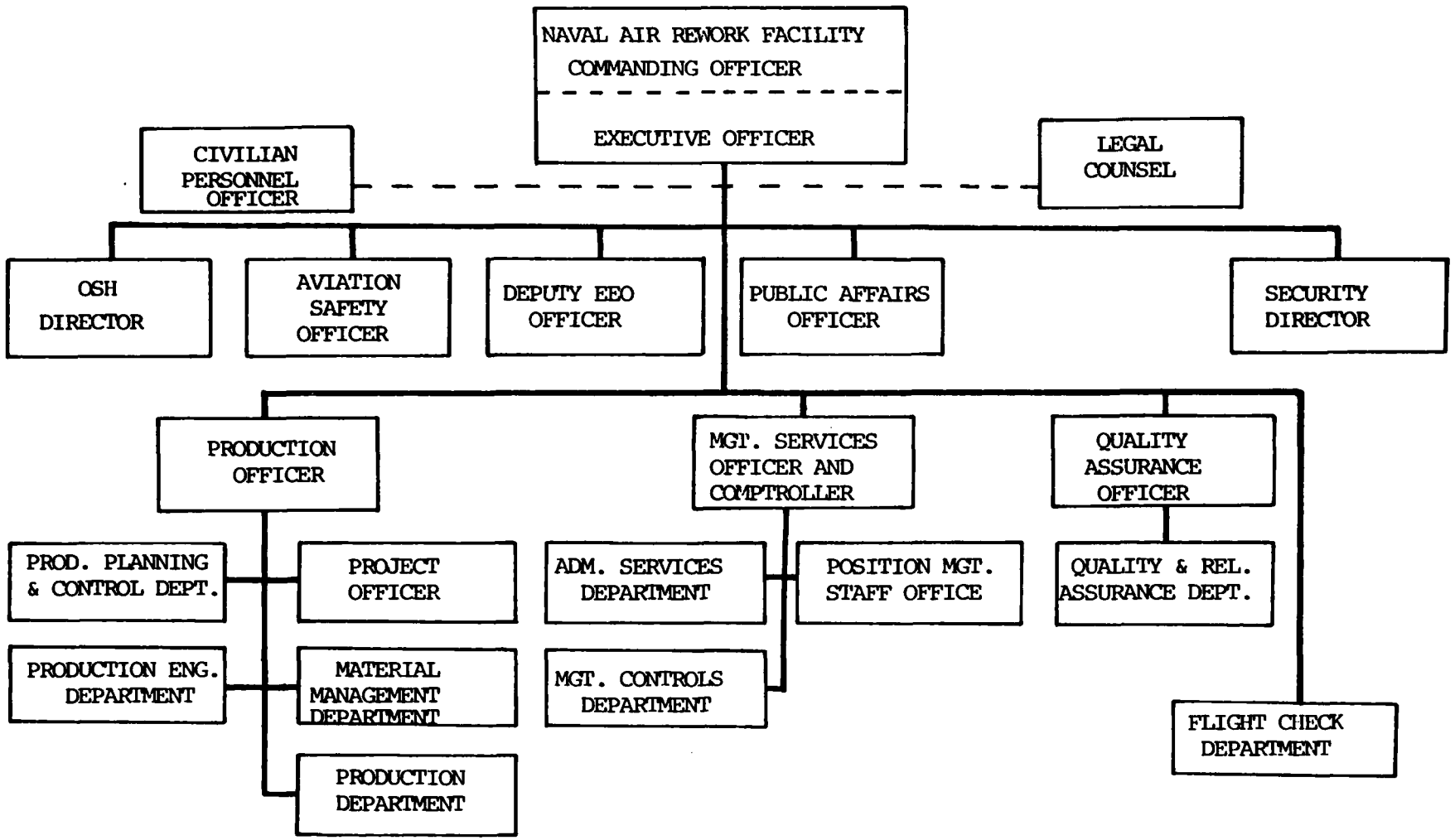


Figure 2.3: NARF Jacksonville Organizational Diagram

Source: NARFJAXINST 5451.1C

Commanding Officer concerning matters which pertain to their respective areas of control. The purpose of these billets, among other things, is to provide a decentralizing effect on the organization by placing more decision making authority at lower levels in the command, to relieve the Command Element of the administrative burden of high level coordination and also to produce a closer knit and more responsive management team. The command is also supported by a number of special assistants functioning in a staff capacity, including Legal Counsel, Occupational Safety and Health Director, Public Affairs Officer, Equal Employment Opportunity Officer and others.

a. Command Element

(1) Commanding Officer. The Commanding Officer is responsible to the Commander, Naval Aviation Logistics Center for mission accomplishment and for directing the operations of the NARF in an efficient, effective and economical manner so that facility output is timely and meets all established requirements and standards for quality and quantity.

(2) Executive Officer. The Executive Officer assists the Commanding Officer in the management of the NARF by concentrating on conformance to established policies and procedures, with special attention directed toward the recommendation of new policies or changes to current ones. The Executive Officer is also responsible to develop or

monitor programs whose purpose is to ensure usage of the facilities and resources of the command to the maximum extent practicable and to promote a spirit of cooperation between the various activities of the facility.

b. Top Management

(1) Production Officer. The Production Officer directs the activities of the Production Planning and Control, Production Engineering, Production, and Material Management Departments. These departments, in particular the Production Department, play the leading role in accomplishing the necessary rework that constitutes the overall mission of the NARF.

(2) Management Services Officer and Comptroller. The Management Services Officer and Comptroller has the responsibility to develop, coordinate and maintain an integrated management program which will provide to top management factual and analytical data essential for effective management control. These activities are carried out within the Administrative Services and Management Controls Departments and the Position Management Staff Office. The Administrative Services Department provides general administrative and office management services as well as coordination and administration of the facility's education and training program. The Management Controls Department is responsible for the design, development and maintenance of an effective management control system. Within this

department, the Comptroller Division provides a full range of budgeting and accounting services including the formulation, presentation and execution of the NIF Operating Budget, Funding Budget and A-11 Budget (long-range, 3 year budget), development of improved financial management systems for effective control of production and overhead costs and administration of the job order costing system. The Position Management Staff Office serves as the focal point for all matters relating to civilian personnel administration, including review of position classifications and descriptions, providing advice and assistance in the development of organizational structure and functional assignments and providing liaison between military managers/department directors and the Civilian Personnel Employment and Civilian Personnel Classification Divisions for actions having internal impact on position structure, functional alignment or other position management related applications.

(3) Quality Assurance Officer. The Quality Assurance Officer directs the efforts of the Quality and Reliability Assurance Department. This department's three divisions develop quality and reliability specifications for all work performed at the facility, monitor and verify the operation of the Quality and Reliability Assurance Program, conduct statistical trend analysis and review technical data and work specifications to ensure that they are accurate, adequate and compatible with quality requirements.

(4) Senior Check Pilot. The Senior Check Pilot is responsible for all aspects of flight check operations. The Flight Check Division of the Flight Check Department supervises the flight test of all aircraft and weapons systems processed by the facility and ensures that the flight test evolutions adhere to all prescribed safety of flight criteria. All test operations are conducted using flight check standards, techniques and procedures designed to minimize costs while properly documenting and reporting the results of all test operations. (NARFJAXINST 5451.1C, 1983)

3. Workload Scheduling and Budgeting

Workload assignments and work schedules received by NARF Jacksonville are controlled by NALC and originate from NAVAIRSYSCOM, NALC and Aviation Supply Office (ASO) requirements and from the operating commands in a direct customer service relationship. Planning of the depot workload covers a five-year period beyond the budget year and is updated based on the forces to be supported and the funds available to perform the work. The schedule is driven by the fact that SDLM is accomplished at specific intervals during the service life of an aircraft, weapons systems or component. The service period for each type/model/series aircraft is determined by engineering analysis based on operating service months and/or flight hours. The SDLM phase is expected to return the aircraft or weapons system to a maintenance condition which can be maintained at the operating squadron or Aviation Intermediate Maintenance Department level.

The workload schedule is used by the Budget Division in preparing the facility's operating budget. In order to budget accurately, NARF Jacksonville has developed and maintains an extensive data base containing historical actual production costs and man-hours required to complete the programs that it operates. Given an anticipated work schedule, the Budget Division is able to use the data base information to develop labor, material and overhead rates for each functional cost code. Civilian labor hours are then adjusted by the appropriate acceleration factor and the material rates are adjusted for inflation and materials cost changes using adjustment guidance provided by NALC. Once adjusted, the rates are applied to the anticipated workload resulting in an annual operating budget. This budget, along with similar budgets submitted by other NARFs, are reviewed by the NALC, who assigns a positive or negative recoupment factor to each NARF's proposed rate structure based on the Accumulated Operating Results (AOR) of each facility. The purpose of this action is to balance the total program with respect to Navy Industrial Fund (NIF) zero profit requirements and to establish the stabilized rates that will be charged to NARF customers during the budget year. (Pendry, 1984)

Work performed by NARF Jacksonville is billed either on a fixed price basis (a firm fixed price is negotiated with the customer prior to commencement of work using a

norm, workload standard or estimated man-hours and multiplying it by the current stabilized rate for the induction fiscal year), a fixed rate basis (the facility is reimbursed by multiplying the actual expended man-hours by the predetermined stabilized fixed rate) or on a cost reimbursement basis (the facility is reimbursed for actual costs. The cost reimbursement basis applies to Foreign Military Sales customers, private parties and non-federal customers only. The stabilized rate does not apply to this category.) All costs experienced by the NARF during work performance are recorded and accumulated on an actual cost basis (Swanson, 1984).

4. Management Controls

The NARF Jacksonville organization manual states that the first step of management control is the organization of the various line operations and staff service functions into a manageable whole, and that established or perfected procedures could not be possible without first having a workable organizational framework for them to operate within. The organizational aspects of NARF Jacksonville have been addressed in the preceding paragraphs. The remainder of this section focuses on the control procedures themselves.

Several means of control operate within the organizational structure of the NARF. The operating budget is a major device used for controlling costs. Although customers are insulated by the stabilized rate structure from the

actual costs of work performed for them, the NARF budgets these actual costs very carefully using the detailed labor, material and overhead rate projections developed from its historical data base and is evaluated on how well it is able to accomplish its workload within the budget.

Reports on a quarterly basis in the form of formal Financial and Cost Statements and a Financial Review constitute another means of control. These reports are sent out to the chain of command and cover the major aspects of the facility's performance including a statement of revenues and costs, a breakdown of revenues and costs by product line, analysis of net operating results, analysis of operations, man-hour comparisons and many others. The NARF also sends a three section Production Performance Report to NALC and NAVAIRSYSCOM. Sections A (Schedule and Completions) and C (Summary, Program, Man-hours, Cost and Supplemental Information) are sent on a monthly basis while Section B (Production, Man-hour and Cost) is submitted on a quarterly basis. The purpose of this report is to permit analysis and evaluation of the operations of the NARF, to encourage more effective management by linking the efforts of the accounting, budgeting, performance analysis and production functions and to facilitate various types of special evaluation studies conducted by auditors, engineering study teams, naval analytical and development centers and others (NAVAVNLOGCENINST 5220.6, 1980).

Another form of control stems from the monitoring and reporting of thirteen key performance indicators. These indicators have been identified by NALC and are subjected to variance analyses in order to measure actual performance. Goals have been established in each of the indicator areas and NARF management reports its progress toward accomplishing these goals to NALC in a monthly report (Naval Aviation Logistics Center letter, October 1983). The thirteen indicators are listed in Table 2.1.

As pointed out by the NARF Jacksonville Management Services Officer, the command actively pursues an internal control program. The NARF conducts its own extensive variance analysis program and provides Cost Center Status Reports to cost center managers. These monthly reports show budgeted direct and indirect costs versus actual costs and provide a narrative explanation of variances greater than 10% and $10,000. In still another control process, the NARF seeks to increase management awareness by publishing monthly Cost Effectiveness Reports. These reports show budgeted versus actual costs in dollars and man-hours for each of the major rework programs (aircraft, engines and components) and for cost elements such as travel, training and contractual services. Actual man-hours expended are closely monitored and compared to historical job norms in an effort to disclose potential problem areas. Materials usage and price changes are also watched carefully in order

TABLE 2.1

KEY PERFORMANCE INDICATORS

- Treasury Cash
- Activity Cash
- Materials & Supplies
- Accumulated Operating Results
- Labor Hours
  - Regular Direct
  - Overtime Direct
  - Regular Indirect
  - Overtime Indirect
- Productive Ratio
- Total Costs
- Revenue
- Personnel on Board
  - Full Time Permanent
  - Temporary

Source: Naval Aviation Logistics Center letter 810/7000/17328 of 17 October, 1983.

to keep production costs down. Finally, the direct/indirect cost ratio is used as a measure of how much production work is being accomplished with respect to the amount of support being provided by the non-production work force. (Levinge, 1984)

III. PRODUCTION FLOW AND COST ACCUMULATION

In this section, the major rework programs operated at NARF Jacksonville are described and the production paths followed by items in these programs are traced. The section concludes with a discussion on how the costs incurred by each of these programs are recognized and accumulated.

A. PRODUCTION FLOW

1. Major Programs

Rework activities at NARF Jacksonville are categorized into five programs: the aircraft program, engines program, components program, other support program and the manufacturing program. Of the five, the aircraft, engines and components programs account for most of the expended man-hours. Discussions with military and civilian managers during an on-site visit to NARF Jacksonville provided information describing how these programs are scheduled and operated. Pertinent aspects of these discussion are summarized in the subsections that follow.

2. Maintenance Requirements

Each program operates on a maintenance workload schedule that has been coordinated by NALC. Although the NARF attempts to follow this schedule, it is important to understand that the facility's mission is to provide timely

depot support to fleet operating forces. This support mission requires that the schedule be flexible enough to accommodate a number of special project and fleet emergency needs. Appendix A lists the various elements of the NARF workload in order of priority. By prioritizing the workload, the decision and scheduling processes are simplified ultimately reducing turnaround time to the customer.

The production flow for each work program begins with planning. The Production Planning and Control Department provides workload planning, production control and examination services. The Production Engineering Department, using current and long range information from the Production Planning and Control Department, NALC and NAVAIRSYSCOM, compiles a specification package containing technical data pertaining to rework capability, optimum sequencing of repair activities, number of days required for completion and equipment required to complete the tasks. This data, along with man-hour and machine time information provided by the Methods and Standards Division, are used by Production Planning and Control to establish workload commitments and production schedules. The process is complex and requires the coordination and cooperation of a vast number of personnel performing in a variety of functions. Craftsmen representing eighty trade skills work in the Production Department, where the responsibility to accomplish the workload assigned to the NARF lies. The command organizational

manual states that "All other departments of the activity exist, primarily, to support the Production Department in turning out work of acceptable quality on schedule and at minimum cost." (NARFJAXINST 5451.1C, p. B-5)

a. Aircraft Program

NARF Jacksonville is a designated maintenance facility for the A-7, P-3, S-3 and S-2 aircraft. During SDLM, each aircraft is inspected and all structural and system related repairs are conducted as necessary. The aircraft is also updated to current standards by having any outstanding airframe or engineering changes installed (OPNAVINST 4790.2B, 1981).

Each type/model/series aircraft has a dedicated rework line and production flow established for it. The work generally begins with acceptance of the aircraft from the customer, followed by a detailed inspection by skilled Examination and Evaluation (E&E) personnel. Following the "inspect and repair as necessary" (IRAN) concept, these artisans provide the Production Planning and Control Department information concerning what repairs are expected to be necessary to restore each aircraft to better-than-new condition. This information, based on material condition, functional tests and aircraft logs and records, enables Production Planning and Control to establish realistic schedules and to limit the depth of overhaul or repair by controlling the extent of disassembly of the aircraft.

As the disassembly progresses, parts and assemblies are inspected further and those scheduled for repair are sent to the various shops which will perform the work. The Materials Management Division places requisitions for components that have been identified for replacement. The aircraft is then stripped of its paint and is subjected to ultrasonic testing for cracks and corrosion. As the work is completed, all parts that had been removed for repair are routed back to the aircraft for reinstallation. The freshly reworked and painted aircraft is thoroughly flight tested before redelivery to the fleet. (Levinge, 1984)

b. Engines Program

NARF Jacksonville is responsible for the overhaul and repair of TF34-GE-400A/400B, TF-41-A-2, J52-P-6B/8B/408 and R1820-82B/82C engines (OPNAVINST 4790.2B, 1981). Once inducted, each engine is disassembled and evaluated. Non-destructive testing is performed to uncover any cracks or flaws. Any defects are corrected if possible by machining, replating or regrinding,or the part may be discarded and replaced by a new one. Turbine blades are cleaned, heat treated and coated with additional metal to extend their useful lives. As in the aircraft program, components are returned to the engine and the engine reassembled and tested. Each engine is run up in a test cell so that all of its operating parameters and performance specifications, such as thrust, temperature and vibration can be checked and verified

to be within limits. After acceptance testing, the engines are either returned to an aircraft for installation or canned and placed into the ready for issue (RFI) pool (Swanberg, 1984).

c. Components Program

Component repair consists of test, check and rework of repairable aeronautical material to return it to RFI condition. This may include update to current revision standards or the first time rework of a new unit for the purpose of establishing rework capability and to develop and document shop procedures and quality standards (OPNAVINST 4790.2B, 1981). This type of work is typically accomplished in a workbench arrangement with all repairs on a given unit performed by one artisan.

When a component is inducted, it is routed to the appropriate shop where the shop supervisor assigns the work to available personnel and is responsible for meeting the repair schedules established by the Production Planning and Control Department. The component is inspected and the malfunction(s) determined. The necessary repairs are made if the required parts are on hand or, if necessary, the component is set aside while awaiting parts. Once the component has been repaired it is tested, calibrated and sent from the shop to its next destination. (Levinge, 1984)

B. COST ACCUMULATION

The purpose of the cost accounting system used by NARF Jacksonville is to provide information that will allow its management to effectively and efficiently apply the facilities resources in accomplishing its assigned mission. The information collected by the system is also vital for use in conducting cost comparison studies between NARFs and with costs experienced by similar commercial industrial operations and for obtaining the total cost for maintaining a particular weapons system (NARFJAXINST 7310.1E, 1980).

1. Job Order System

Expended man-hours, labor costs and materials costs incurred during the performance of maintenance activities are collected in the job order system by job number and shop number. These classifications are the basis for cost distribution against the proper expenditure accounts and appropriations. NARF Jacksonville's cost accounting system is designed to accumulate detailed costs for end products by making maximum use of specific job orders. The system distinguishes between direct and indirect work programs, with each major work program (aircraft, engines, components, etc.) set up to accumulate direct man-hours and material costs. The indirect work programs exist to distinguish between overhead man-hours and costs accumulated in production cost centers and those accumulated in general cost centers. Each work program is assigned a single specific digit to identify it, this digit

being incorporated as the first digit of each individual job order number. Table 3.1 is an excerpt from the NARF cost accounting manual showing the work program codes used for the six direct work programs at NARF Jacksonville.

TABLE 3.1

DIRECT WORK PROGRAM CLASSIFICATIONS

Work Program Code	Direct Work Program
0	Aircraft Rework
1	Missile Rework (not used)
2	Engine Rework
3	Components, GSE and SECOMPT
4	Other Support
5	Manufacturing for Stores/ Inventory

Source: NARF Jacksonville Instruction 7310.1E

Aircraft SDLM/crash damage direct labor charges to be made against aircraft job order numbers begin on the actual day of induction and end when the aircraft is delivered to and accepted by the ferry pilot. All costs incurred prior to actual induction and not incident to the rework process, such as de-arming, defueling and others are charged against the appropriate category in the Other Support Program. All other subprograms of the Aircraft program are costed on the "chock-to-chock" concept; that is, charges begin to accumulate

on the job order number as soon as the aircraft arrives at the NARF and cease on the day it leaves the custody of the facility. In the case of the Engines Program, costs begin to accumulate as soon as the engine container is opened. Direct labor chargeable to an engine job order includes decanning and depreservation, disassembly sufficient for inspection of all operating components and basic engine structures, cleaning, all repair work, testing and reservation and canning. Also included are the costs of repairs to the engine container, which is reworked concurrently with the engine and charged to the engine job order number. Charges cease when the engine has been re-canned and the last bolt tightened. Components Program job orders are opened with the physical acceptance of the item into the facility and terminate when the item has been accepted by the NAS Jacksonville Supply Department as RFI. All processing costs, including depreservation, rework, manufacture, minor container repair, preservation and packaging is charged to the particular component job order number (NARFJAXINST 7310.1E, 1980). A sample job order from the Aircraft Program is included in Appendix B.

2. Labor Distribution

The NARF uses both labor distribution cards (time cards) and a computerized transacter system to record the time worked by every employee at the facility. By recording the job order number to which each labor hour was dedicated,

either on the labor distribution card or by the transacter system, a cycle of cost accounting is begun which ultimately results in the determination of the total cost to process each job. The accuracy of these total cost figures is dependent on the accuracy with which the labor distribution cards, the transacter and the materials issue/return documents are used (NARFJAXINST 7310.1E, 1980).

The transacter is the primary device used to enter labor hours into the accounting system. It is similar to a computer terminal but is used for data entry only. Each shop artisan makes a transaction when work on a unit is stopped for reasons such as awaiting parts, task completion or end of shift. The transaction is made using two cards. One card is a plastic identaplate which is embossed with personal information, including name, shop number, and most importantly, wage rate. The second card comes from the deck of cards provided by the Production Planning and Control Department. It contains, among other items, the specific tasks to be performed by the artisan as part of the overhaul and the standard number of hours that each task should require. The artisan makes a transacter entry when each task is completed by placing both cards into the terminal. This causes the individual's personal data, elapsed time and the job order number to be recorded. The computer applies the wage rate using the elapsed time calculated and records the labor cost and man-hours expended to the specific job order.

Employees who do not use the transacter system complete essentially the same process by filling in a detailed breakdown of time spent on each job order on the labor distribution card. These cards are collected at the end of each accounting period (weekly), verified and key punched into the computer. (Brinson, 1984)

3. Materials Requisitions

Materials costs represent approximately 35-45% of the costs incurred in the production effort. Charges for all materials used in the rework process are identified by job order and shop number. Materials are obtained by submitting a DD Form 1348-1 requisition. Requests are processed by the Material Services Division and are obtained through a variety of channels, including the Navy Supply System, commercial vendors or through NIF Stores. The Materials Services Division maintains order status on all requisitions and ensures that all material received and issued is charged to the correct job order. Another important aspect of the materials costing process is the disposition of materials determined to be in excess of those required to complete the job. The Material Expediting and Reconciliation Branch ensures proper processing of excess materials returned to the supply system and makes certain that appropriate job orders receive proper credit. In addition to excess materials, certain types of nonconsumable materials (exchange items) are given an 80 percent credit on standard inventory

price when turned in for an RFI replacement. Timely processing of these credit-eligible materials makes available valuable resources for use in other program areas. (NARFJAXINST 7310.1E, 1980)

4. Overhead Application

As previously discussed, the indirect work program structure was established to distinguish between overhead man-hours and costs accumulated in production cost centers and those accumulated in general cost centers. Production overhead consists of labor expended by employees of a production cost center while performing services not identifiable or properly chargeable to a direct job order (can also include indirect labor expended by general cost center personnel). The production overhead rate is calculated by dividing the estimated indirect expenses to be incurred in each production cost center by the total estimated direct labor hours to be worked in each production cost center. Indirect production expenses include such elements as shop supervision, training, maintenance of equipment and tools and cleanup.

General and Administrative overhead consists of efforts which indirectly benefit the direct work of all production areas but cannot be specifically or economically identified to any one production cost center. The G&A overhead rate is calculated by dividing the total estimated general and administrative expense for the entire facility by the total estimated direct labor hours to be worked in the facility during the period.

The total production and general overhead expenses are calculated by the computer by simply applying the respective rates to the number of direct man-hours recorded for each job order number, with production overhead being applied at the rate for the production cost center in which it was incurred and the general overhead being applied based on the total number of direct labor hours worked on each job order. (NARFJAXINST 7310.1E, 1980)

In the next section, a closer look at the Maintenance Cost and Production Report used by OASD in its decision making processes is conducted. Maintenance costs contained in the report are examined and related to the costs accumulated by the accounting system at NARF Jacksonville.

IV. REPAIR COST DATA ANALYSIS

This section explains how the cost data from the NARF Jacksonville cost accounting system is transformed into the format required by OASD and the path which it follows to arrive in the OASD data processing system. Also, an attempt is made to validate this sequence of events by analyzing portions of OASD report RCS DD-M(A) 1397, the Maintenance Cost and Production Report.

A. DATA FLOW FROM NARF JACKSONVILLE TO OASD

DoD Instruction 7220.29-H provides guidelines for each depot maintenance activity (DMA) to follow in the preparation and submission of accumulated maintenance costs. Specifically, the data is to be updated and submitted quarterly on a cumulative basis for provisionally closed job orders. The final fiscal year tape is to be submitted to OASD (MI&L) within 90 days of the end of the fiscal year.

At NARF Jacksonville, the responsibility for producing the quarterly data tape lies with the Information Systems Division of the Management Controls Department. In order to carry out its responsibilities, the Information Systems Division has developed, using DoD Instruction 7220.29-H and NAVCOMPT Instruction 7310.9D as guidelines, computer software that interfaces with the NARF Jacksonville cost accounting

system data base. This software extracts relevant information already present in the cost accounting data base and rearranges it into the tape format required by the DoD handbook (Begley, 1984). The process also involves a minor amount of manual data entry at the end of the reporting year to include items not normally tracked by the NARF cost accounting system, such as military hours and depreciation cost and to correct any data entries that might have been discovered. (Giddens, 1984).

In addition to processing NARF Jacksonville data, the Information Systems Division is also responsible for collecting similar data from the remaining five NARFs in the rework system. Programs similar to the one in use at Jacksonville have been developed and provided to the Naval Regional Data Automation Centers (NARDACs) servicing each of the other NARFs. The Information Systems Division collects all the individual site data tapes, compiles them into one master tape and forwards the master to the Comptroller of the Navy (NAVCOMPT). NAVCOMPT performs a similar function in that it collects maintenance cost data tapes from all other Navy DMA consolidation points and compiles it into yet another master tape. An edit, in the form of a data type/field validation is performed and error listings generated. Errors are corrected by NAVCOMPT through liaison with the affected site when possible, and by resubmission of corrected data

by the affected site if required. Once all data has been validated, the tape is forwarded to OASD for entry into the Defense Management Data Center (DMDC) data base. Throughout the validation process, no attempt is made to verify that the quantities and dollar amounts in the various data fields are in themselves correct, or whether the reporting sites were authorized to or routinely perform maintenance on the particular weapons system and/or components reported. The edit is performed simply to ensure that the data types required by each field are correct, that is numbers only in a numeric field, letters or numbers in an alpha-numeric field and so on. (Begley, 1984)

B. ANALYSIS OF RCS DD-M(A) 1397 DATA

During the research phase of this project, the notion, either real or perceived, that the maintenance cost and production data reported by DMAs was "not right" was encountered. In order to determine whether this was a valid issue, an on-site visit to NARF Jacksonville was conducted with the express purpose of comparing the cost data collected at the site to the data that was present in the OASD data base. Jacksonville was selected as the data site because it performs, in addition to the normal depot repair tasks, the function of consolidating the cost accounting data from all six NARFs for submission to OASD.

The report used as a basis for the comparison, RCS DD-M(A) 1397, consists of a set of fourteen tables which display the accumulated repair cost figures in several different formats. A separate set of tables is produced for each service at the end of the fiscal year. A brief description of each of the tables and the data that they present is included in Appendix C. The tables are produced by OASD through the use of special software. The software extracts the desired information from a data base which has been built up using the data contained on the magnetic tapes submitted quarterly by each of the services. In addition to producing the tables for each service, the program will, through user modification of output parameters, present the data in virtually any format desired.

The repair costs used for this restricted comparison were taken from four of the fourteen tables comprising the OASD report. Table 4, Selected Facility Performance Statistics, presents total cost, civilian labor cost per hour, material cost per labor hour, G&A cost per labor hour and other pertinent statistics by site for the fiscal year. Table 5 is a compilation of costs by facility and commodity, such as aircraft, weapons and munitions and ships. Table 6 is a cost breakdown by organic depot maintenance activities, such as labor hours, direct labor, direct material, total cost and others. Table 14 is comprised of a list of items which are repaired at more than one facility and meet the

criteria of production quantity times total cost greater than or equal to $50,000. The cost figures used for this comparison were taken from tables for fiscal years 1982 and 1983.

The first step in the validation was to attempt a correlation of NARF Jacksonville's total cost figure and the total cost as reported by Tables 4, 5 and 6 of the OASD report. This was accomplished by obtaining the total cost figure from NARF Jacksonville accounting records and comparing it directly to the total cost figures shown in the tables. The results are summarized as follows:

1. In FY82, the OASD figures showed a variance of only 1.08% from the Jacksonville figure. The total cost figures between Tables 4, 5 and 6 were equivalent when adjusted for roundoff.

2. In FY83, a total cost figure of $214.697 million from Jacksonville records was compared to OASD figures of $193.9 million (Tables 4 and 5) and $214.913 million in Table 6. The figures other than total cost which are reported in Tables 4, 5 and 6 were consistent with one another, leaving the $21 million anomaly in total cost between Tables 4 and 5 versus Table 6 unexplained.

The cost data contained in Table 6 of the OASD report along with site records for fiscal year 1983 is shown in Table 4.1.

The next step in the validation process consisted of a comparison of cost data on ten items selected from OASD Table 14, specified by their 13 digit item identification numbers (field 17 of the magnetic data tape), that had been repaired during FY82 or 83. To accomplish this step, a listing of all costs and labor hours for the ten items was retrieved

TABLE 4.1

COST BREAKDOWN BY ORGANIC DEPOT MAINTENANCE ACTIVITIES
FISCAL YEAR 1983 ($000)

COST ELEMENT	NARF JAX	OASD
Labor Hours (000)	2,681	2,680
Direct Labor	38,594	38,646
Direct Material	91,043	90,575
Other Direct	614	614
Maintenance Support	16,093	16,092
Production Indirect	29,501	29,496
G & A	38,852	39,490
Total Cost	214,852	214,913

from the OASD data base and identical data extracted from NARF Jacksonville records. A sample comparison of these two sets of data is shown in Tables 4.2 and 4.3. Overall, the costs in this limited sample matched one another well, the largest difference being only $1085 for a trailer (standard inventory price $8370) repaired in FY82.

The final step in the validation process was to examine and compare the figures listed in Table 14 of the OASD report. The intention of this table is to offer a comparison of maintenance costs on a per unit basis between facilities performing the same category of maintenance on idential items. The data seems to suggest that this may be used to compare the efficiency of the various facilities concerned. Also such comparisons, in theory, could be used by program managers in reaching workload assignment decisions or to identify areas requiring increased management attention and/or emphasis.

Table 4.2

FY 82 COST COMPARISON

Item ID 6115002882970
Nomenclature Generator

		NARF Jax	OASD
Direct Labor-Production	cost	$3515	$3515
	hours	273	273
Direct Labor-Other	cost	$ 0	$ 0
	hours	0	0
Direct Material	funded	$1472	$1472
Investment Matl	unfunded	0	0
Exchange Matl	unfunded	0	0
Modification Kits	unfunded	0	0
Other Direct Costs	funded	0	0
	unfunded	0	0
Operations Ovhd	funded	2802	2802
	unfunded	120	120
General & Admin	funded	3235	3235
	unfunded	103	162
Quantity Completed		30	30

Table 4.3

FY 83 COST COMPARISON

Item ID 6115002882970
Nomenclature Generator

		NARF Jax	OASD
Direct Labor-Production	cost	$2739	$2739
	hours	230	230
Direct Labor-Other	cost	$ 0	$ 0
	hours	0	0
Direct Material	funded	1942	1942
Investment Matl	unfunded	0	0
Exchange Matl	unfunded	0	0
Modification Kits	unfunded	0	0
Other Direct Costs	funded	0	0
	unfunded	0	0
Operations Ovhd	funded	2505	2505
	unfunded	43	43
General & Admin	funded	3317	3317
	unfunded	0	52
Quantity Completed		22	22

However, it will be shown that this data, if taken at face value, can lead to potentially improper conclusions.

In researching the Table 14 data, an effort was made to select items having a wide variation in unit cost and with relatively similar quantities being worked in order to minimize the impact of economies of scale. While the first condition was easily satisfied, the lack of any significant overlap in items repaired at more than one site made the second condition virtually impossible to achieve. Moreover, the items chosen are used only to illustrate situations that, if not investigated fully, could inject erroneous data into the decision making process. The use of these specific items does not represent any sort of valid statistical analysis technique or audit procedure which could be extended to the entire population. Item selection was further restricted to only those items repaired at NARFs Jacksonville and Pensacola in order to minimize the impact of differences in wage rates over the geographic regions in which the various NARFs are located.

Based on the above criteria, cost data on eight items for the period FY79 through FY83 was obtained from OASD. The bulk of this data is included in Appendix D. The method for this last step was to examine and compare the costs experienced for each specific item at the two sites over the five-year period to determine if they would be suitable for

use as inputs to high level depot repair program decisions. A secondary accuracy check was also performed by comparing the quantities completed, total costs and unit costs for each item that had been selectively retrieved from the OASD data base to those same elements reported in Table 14 (for fiscal years 1982 and 1983 only). The five-year data for one of these items (item # 5826000592726) is shown for each site in Tables 4.4 and 4.5.

A review of both the selected items and the Table 14 data in general produced the following results:

1. Table 14 does not contain all items eligible for inclusion.
2. There are inconsistencies in arriving at the total cost figures displayed in Tables 4, 5 and 6.
3. FY83 total cost and unit cost to repair as reported in Table 14 are consistently lower than the total costs obtained from summing the costs from the individual records retrieved from the same data base.
4. Errors in the standard inventory price occur frequently.
5. Items distinguished by other than a 13 digit item identification number such as P3C or S3A do not lend themselves to a comparison such as is made in Table 14 because no indication of scope of work is made.
6. Dual site repair of many items does not occur consistently (as evidenced by the data in Tables 4.4 and 4.5).

Several conclusions may be drawn from the results of this simple and admittedly incomplete analysis. First, steps one and two demonstrate that the process of preparing and submitting the magnetic data tape at NARF Jacksonville provides

Table 4.4

FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Amplifier

	79	80	81	82	83
Inventory Price	831/960	864	831/911	831/1434	831/2025
Customer	AF,N	DSA,AF N	AF,N	AF,N	DSA,AF N
Dir. Civ. Labor Production Cost	6231	6154	11469	16694	8238
Dir. Civ. Labor Production Hours	470	466	734	1027	566
Dir. Civ. Labor Other Cost	0	140	0	0	0
Dir. Civ. Labor Other Hours	0	8	0	0	0
Dir. Matl. Cost Funded	1751	2896	3575	6487	4321
Dir. Matl.-Investment Unfunded	0	0	0	0	0
Dir, Matl.-Exchanges Unfunded	1902	752	0	2790	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Opns. Ovhd. Cost Funded	3572	4249	7622	11078	7748
Opns. Ovhd. Cost Unfunded	344	288	586	576	110
G & A Expense Funded	5163	5568	7814	12393	8114
G & A Expense Unfunded	292	219	424	490	146
TOTAL COST	19255	20266	31490	50508	28677
Prod. Qty. Compl.	48	98	210	230	108
Hours/unit	9.8	4.8	3.5	4.5	5.2
Dir. Matl/unit	36.50	29.55	17.02	28.20	40.01
Cost/unit	401.15	206.80	149.95	219.60	265.53

Customer codes: N = Navy, AF = Air Force
DSA = Defense Security Assistance

Table 4.5

FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Amplifier

	79	80	81	82	83
Inventory Price			1434	999999	2025
Customer			N	N	N
Dir. Civ. Labor Production Cost			66	1532	750
Dir. Civ. Labor Production Hours			4	110	55
Dir. Civ. Labor Other Cost	N	N	0	33	0
Dir. Civ. Labor Other Hours	O	O	0	3	0
Dir. Matl. Cost Funded	D A	D A	0	107	0
Dir. Matl.-Investment Unfunded	T A	T A	0	296	0
Dir, Matl.-Exchanges Unfunded	A	A	0	0	0
Dir. Matl.-Mod. Kits Unfunded	V A	V A	0	0	0
Opns. Ovhd. Cost Funded	I L	I L	32	843	490
Opns. Ovhd. Cost Unfunded	A B	A B	2	64	51
G & A Expense Funded	L E	L E	52	1623	836
G & A Expense Unfunded			4	113	64
TOTAL COST			156	4611	2191
Prod. Qty. Compl.			1	13	7
Hours/unit			4.0	8.5	7.9
Dir. Matl/unit			0	8.23	0
Cost/unit			156.00	354.69	313.00

Customer Code: N = Navy

OASD with reasonably accurate and complete repair cost data. Secondly, the computer program used by OASD has the capability to present cost data in other useful formats that would supplement the data now contained in the report. Table 14 presents to the decision maker, Congressional staff member, GAO auditor or other interested party only total quantity completed, total cost and cost per unit for each item. Since there are a number of areas of uncertainty concerning exactly how these costs are derived, serious questions must arise as to whether or not the data as aggregated and presented in the table is sufficiently adequate to be used in making decisions based on the objectives stated in the DoD 7220.29-H. The final section of this report addresses these and other such problem areas.

V. CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the findings of the study and offers recommendations for system improvements or areas where it is felt that further study is required.

A. DEPOT LEVEL CONCLUSIONS AND RECOMMENDATIONS

As stated at the outset, one of the reasons for conducting this study has been to determine if the Naval Air Rework Facility cost system accumulates and reports information which is consistent with OASD requirements or whether the two systems are disconnected. After reviewing the NARF Jacksonville system, it can be said that cost data submitted to OASD via NAVCOMPT meets the format requirements established by DODINST 7220.29-H and that the data received by OASD is the same data maintained in the accounting records at the site. Nothing was discovered in the process which would result in spurious data being injected into the system.

The software programs used by each NARF to accumulate cost information for OASD were designed using the 7220.29-H as well as the Navy's implementing instruction, NAVCOMPINST 7310.9D, as guidelines. While use of these instructions as guidelines has insured that the data is presented in the prescribed format, there are instances where differences in accounting procedures between the DoD handbook and the NAVCOMPT

instruction have caused costs to be reported contrary to the DoD handbook. For example, the DoD handbook specifies that military labor hours will be charged as unfunded costs to appropriate job orders at 0.070% (Officer) and 0.077% (Enlisted) of the annual composite standard rates for military personnel as provided in DODINST 7220.29-H (Accounting Guidance Handbook) whereas the NAVCOMP instruction directs NARFs to use the military rates delineated in the NAVCOMPT manual when computing and costing military labor. This and other similar differences, as well as differences in costs between services which result from unique procedures were considered to be beyond the scope of this research project and therefore were not investigated in detail.

Recommendation 1: Conduct a review of the Navy's implementation of DODINST 7220.29-H to ascertain where differences in accounting practices still exist. Determine what impact these have on the objectives set down in the DoD handbook.

Secondly, errors in the data submitted to OASD by individual sites do occur, as evidenced by the cost information presented in Section IV and Appendix D. Instances of otherwise undocumented data omissions and losses were reported by OASD personnel during the data gathering phase of this report. Although the data obtained from the NARF Jacksonville system proved virtually free of errors when compared to the data in the OASD data base, a more comprehensive analysis is required to establish an accuracy percentage for the system as a whole and to determine which data fields would result in

erroneous decisions if an error were to occur in them. Expansion of tape validation procedures to include data accuracy checks in addition to the field validation checks currently performed would contribute to a higher accuracy level.

Recommendation 2: Conduct a statistical analysis of data submitted by NARFs to establish a baseline accuracy figure.

Recommendation 3: Examine the feasibility of expanding current magnetic data tape validation procedures to include checks for operator entry errors and checks for reasonableness.

The last item of note from the depot perspective is that of program visibility. The information reported as required by the DoD handbook is considered by some field personnel to be redundant since it is almost identical to the information reported to NALC in the Production Performance report (NALC letter 2113B/7100/2325, 1982). Since the inception of the OASD cost accumulation program, site personnel have received little or no feedback concerning the data they have submitted and therefore have serious questions as to how and to what extent the data is being used. NARF Jacksonville personnel expressed a commitment to providing accurate and timely data to OASD but felt that some sort of acknowledgment of the data from higher levels in the chain of command would both confirm a need for the data exists and support the spirit of cooperation.

Recommendation 4: Provide both positive and negative feedback to sites responsible for submitting uniform cost accounting data to OASD.

B. OASD LEVEL CONCLUSIONS AND RECOMMENDATIONS

A second reason for conducting this study has been to determine if the data as presented in the Maintenance Cost and Production Report was suitable as a decision maker's tool for comparing costs between depots, assessing efficiency and productivity, developing cost and performance standards, and focusing management attention. The second part of Section IV is devoted to an analysis of four of the fourteen tables which make up the report. It was found that most of the discrepancies found in the tables seem directly related to problems with the software used by OASD to generate the report. For example, the figure for Total Cost at a facility (NARF Jacksonville in this example) appears in each of Tables 4, 5 and 6. Table 4 presents, in addition to total cost, other performance statistics such as civilian labor cost per hour, material cost per labor hour, G&A to labor ratio and material to labor ratio, which are derived from the organic depot maintenance activities cost totals in Table 6. While the statistics themselves are properly calculated, the total cost figure differs by $21.013 million. The total cost figure in Table 5 is obtained by summing costs by commodity. In the case of NARF Jacksonville, the commodities "aircraft" and "other" were summed to provide a total cost

of $193.9 million, which matches the figure in Table 4. The total cost figure in Table 6 closely matches the figure provided by NARF Jacksonville for FY 82 and 83, and the total cost figures for FY 82 were consistent between the three tables, indicating some change in the data entered or its aggregation occurred.

Turning to Table 14, several problem areas make themselves immediately apparent. First, this limited survey alone revealed three items which met the $50,000 criteria established for inclusion in the table, but yet were not present. The omission occurred with no apparent order from year to year and was not restricted to any particular item. Next, the program algorithm for computing the total cost of repair for an item included in OASD Table 14 is inconsistent. As shown by the data in tables 4.4 and 4.5, NARFs perform work for several classes of customers. The total cost figure for some items repaired included only those costs incurred while performing work for Navy customers. However, other items in Table 14 displayed a total cost figure which represented the summation of costs attributable to each customer for whom work on these items was performed. This problem was also found to occur from year to year and was not restricted to any particular item. In fact, any specific item could have its total cost computed in an entirely different manner from one year to the next. Lastly, the total cost figure in Table 14 (FY 83 data) did not match the total cost figure

which was obtained by summing the costs in the individual data records for the item in question (Table 14 total cost was consistently lower). This, of course, results in a higher true unit repair cost than the cost shown in the table.

Recommendation 5: Initiate a study which will review program calculation and data manipulation procedures and determine if these procedures result in correct presentation of cost information in the data base.

In order to estimate site efficiency from the Table 14 comparison, the user must accept the implicit assumptions embodied in the table. Some of these assumptions are that production procedures at each site are the same and that materials costs, labor costs and other rates are constant. The table also fails to take into consideration the condition of the items repaired and assumes that the scope of work performed on the item is the same at both/all sites. This last aspect can be particularly misleading in the case of items identified by other than a 13-digit ID number. For example, the reader has no way of knowing what level of effort was required to perform repairs at NARFs Jacksonville and Alameda on an item coded "P3C". An extensive rework may have been performed at one site while minimal repair work had been done at the other, resulting in a wide disparity in unit repair cost. To conclude that one site was apparently more efficient than the other due to a lower unit repair cost could be seriously in error. Furthermore, all items are not consistently repaired at more than one site, making

the intermittent data unreliable for use as a decision aid. Table 14, in its present format, does tell the reader which items were dual sited, how many of the items were repaired at each of the sites and the total cost experienced by each site (two of these data elements, quantity completed and total cost, subject to the errors mentioned above).

Recommendation 6: Comparing two depots as is currently done in Table 14 is misleading and could result in erroneous decisions. If kept in its present format, the table may be misleading and consideration should be given to reformatting this table to include additional information as discussed below.

If current data are presented in a format such as in Tables 4.4 and 4.5, the attention of the decision maker could be drawn to the total cost picture, and allow him or her to see where legitimately (or perhaps illegitimately) large differences, such as those for materials or labor, have had an appreciable impact on unit repair cost. Additional inquiries could also be initiated if unusual trends in man-hours per unit or materials cost per unit became apparent. In addition to reformatting OASD Table 14, three other constraints on the criteria for inclusion would result in a more meaningful set of cost comparisons if imposed. First, some maximum allowable difference in number of items repaired between the two or more sites being compared should be established for each item that is repaired at more than one site. This would help to minimize the distortion of cost per unit resulting from spreading various fixed and overhead costs over a fewer number of items at one site or the other.

Recommendation 7: Establish a relevant range of differences in quantities of each specific item repaired and exclude items falling outside this range from comparison in Table 14.

Secondly, if an item is not repaired in two consecutive years at a particular site, it should be excluded from the table. This would help to offset the impact of the learning curve and economies of scale enjoyed at sites where an item is regularly inducted. Examination of the cost data provided by OASD also showed that items are not consistently reworked at more than one facility. Therefore, in order to make cost comparisons meaningful, the comparisons should span several time periods. In special cases, however, use of first time or one year data could provide insight into start-up costs experienced by a site for first time repair of an item or for repairs beginning after some period of inactivity. In any case, the user should be made aware that the figures as presented may result in a less than optimum comparison.

Recommendation 8: Exclude items that have not been consistently reworked at more than one site for two or more years from comparison in Table 14, or include the data only after cautioning the user about the possibility of misinterpretation.

Lastly, Table 14 presently compares dissimilar work performed on homogeneous systems such as ships and aircraft. For reasons mentioned above, items coded by anything less than a 13-digit number cannot be specifically identified and therefore, should not be compared.

Recommendation 9: Table 14 comparisons should only consist of items with identical 13-digit item identification numbers.

The last issue to be discussed with respect to OASD is the timing for the reporting of costs experienced by a facility in the course of conducting depot level maintenance activities. Cost data is reported only on those jobs which have been completed during the period of the report, regardless of the year of induction into the repair facility. This procedure distorts the maintenance costs actually experienced by the facility in any given year. For example, a job opened in FY 83 and completed in FY 84 would have all of its costs reported as FY 84 costs even though a significant portion of them may have been incurred in the previous year. If the intention of the RCS DD-M(A) 1397 is to provide, as an input to total annual weapons system cost, the dollars spent on depot level maintenance, then the system of cost accumulation must be revised to distinguish between work-in-process costs and finished goods costs.

Recommendation 10: Conduct a study to determine the desirability or necessity of incorporating equivalent unit maintenance and work-in-process accounting. The benefits of such a system should be weighed against the costs in manpower, time and dollars to implement such a system.

C. RECOMMENDATIONS FOR FURTHER STUDY

In addition to the specific recommendations for further study made above, the following are suggestions for additional research to enhance the scope of this report:

1. Conduct an analysis of each of the tables not covered in this report to determine if the data is correctly and/or accurately presented and meets the decision making objectives of DODINST 7220.29-H.

2. Conduct a survey of current and proposed cost reporting systems to determine if duplications or omissions exist.

3. Conduct a review of current OASD software programs and documentation to determine if maximum results are being obtained from them. If required, develop or update software to provide enhancements deemed necessary in order to meet the objectives of 7220.29-H. Provide or update user guides to provide information concerning existing and newly developed capabilities.

D. SUMMARY

In conclusion, this study attempts to determine the extent to which various depots use uniform cost accounting procedures and provide valid data to OASD. The study suggests that while there may be problems in depot level data accumulation, a viable system exists and the errors do not (if NARF Jacksonville is representative of other NARFs) present a problem of any serious proportion. A problem may exist in the final presentation of the data by OASD. It seems that the format of tables in the OASD report provide information which may be subject to misinterpretation. However, reformatting of selected tables should minimize the possibility of misinterpretation by the reader.

APPENDIX A

DEPOT MAINTENANCE WORKLOAD PRIORITIES

Priority Number	Type of Work
1	Special projects. Reserved for specific assignment by NAVAIR to fulfill emergency requirements of CNO.
2	Prototypes and projects of an urgent nature directed by NAVAIR/NALC. NICRISP II [Navy Integrated Comprehensive Repairable Item Scheduling Program weekly level one requirements (including GSE components with some level one criteria)]. Closed Loop Aeronautical Management Program (CLAMP). Emergency in-use GSE requirements (carrier deployments, aircraft down for GSE).
3	Acceptance and transfer of aircraft and/or missiles in delivery. Aircraft in NAVAIR field activities custody awaiting delivery and requiring corrections of discrepancies and/or installation of mandatory technical modification. Investigations required by aircraft accident boards, boards of investigation or boards of inquiry. Manufacturing, NICRISP II weekly level two (including GSE components) and level scheduling (HI-BURNER) requirements. Emergency repairs to missiles, aircraft, power plants, components and customer services to meet operational requirements established by command authority. Regularly scheduled in-use GSE requirements, including calibration and related support services.

Field team modifications and on-site GSE (including calibration) field team support.

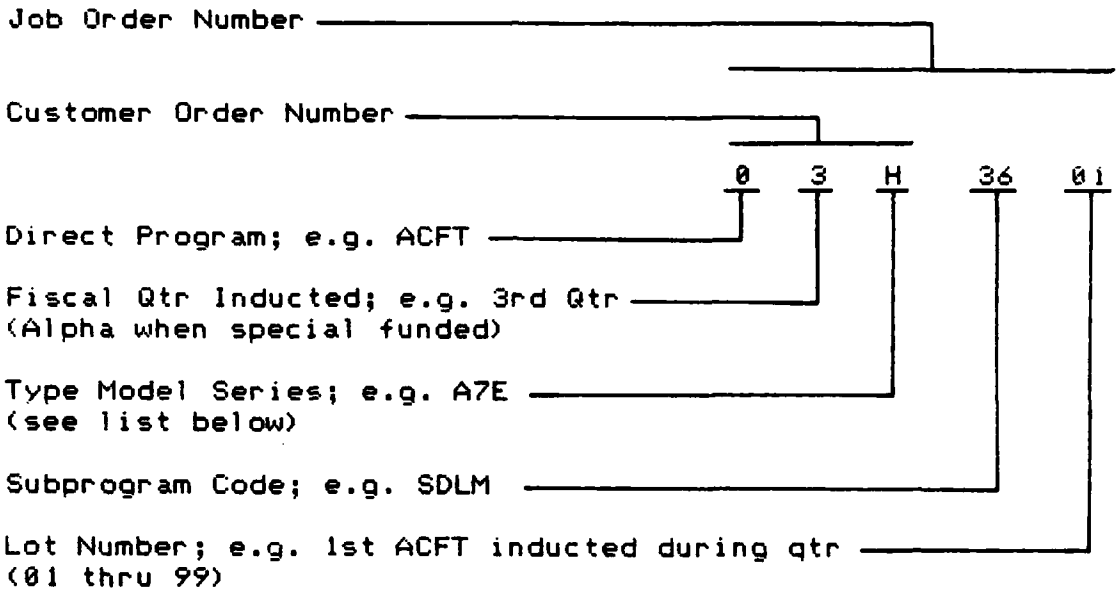
4 Programmed depot level maintenance workloads. Standard Depot Maintenance (SDLM) of aircraft; rework of missiles, power plants, NICRISP II weekly three or four level requirements (including GSE components), support equipment and related routine supporting programs.

Routine prototypes and projects (not specified under priority 2 above).

5 Preparation of aircraft for delivery to storage points. Salvage and reclamation.

APPENDIX B

DIRECT JOB ORDER STRUCTURE FOR AIRCRAFT PROGRAM



TYPE MODEL SERIES - AIRCRAFT

Code	TMS	Code	TMS	Code	TMS
A	A7A	J		S	P3A
B	A7B	K	S2G	T	S2E
C		L	S2D	U	
D	RP3D	M	E1B	V	YS2G
E	P3B	N	ES2D	W	P3C
F	A7C	P	US2D	X	
G		Q		Y	
H	A7E	R		Z	C1A

Source: NARFJAXINST 7310.1E, July 1, 1980.

APPENDIX C

OASD RCS DD-M(A) 1397 TABLE DESCRIPTION

Table Number	Description
1	Total Depot Maintenance Cost
2	Cost by Program Element and Commodity
3	Cost by Facility Type and Commodity
3A	Cost by Facility Type and Commodity-Depot Maintenance Work Performance Categories
3B	Cost by Facility Type and Commodity-Maintenance Support Work Performance Categories
4	Selected Facility Performance Statistics
5	Cost by Facility and Commodity
6	Cost Breakdown by Organic Depot Maintenance Activities
7	Organic Non-Depot Maintenance Activities
8	Cost Breakdown by Contract Activities
9	Cost Breakdown by Interservice Activities
10	Total Cost by Weapon System and Depot Maintenance Work Performance Categories
11	Maintenance Support Work Performance Categories
12	Items Maintained in Excess of 100% of Standard Inventory Price by Facility (Total Excess Greater than $10,000)
13	Total Cost by Weapon System and Work Breakdown Structure (Depot Maintenance Work Performance Categories)
14	Items Repaired at More than One Facility (Production Qty. x Total Cost Greater than or Equal to $150,000)

APPENDIX D

FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Actuator

	1979	1980	1981	1982	1983
Inventory Price	$1550	$1550	$1550	$1550	$1550
Customer	N	N	N	N	N
Dir. Civ. Labor Production Cost	12234	1433	698	547	631
Dir. Civ. Labor Production Hours	1014	115	57	41	48
Dir. Civ. Labor Other Cost	0	0	0	0	0
Dir. Civ. Labor Other Hours	0	0	0	0	0
Dir. Matl. Cost Funded	7453	14167	4547	388	1910
Dir. Matl.-Investment Unfunded	0	0	0	0	0
Dir. Matl.-Exchanges Unfunded	0	0	0	0	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	5880
Opns. Ovhd. Cost Funded	7579	920	498	381	520
Opns. Ovhd Cost Unfunded	418	35	24	13	10
G & A Expense Funded	11154	1366	602	487	687
G & A Expense Unfunded	617	46	33	27	11
TOTAL COST	39455	17967	6394	1763	9649
Prod. Qty. Compl.	26	30	8	7	5
Dir. Lab. Hrs/unit	39.0	3.8	7.1	5.8	9.6
Dir. Matl./unit	286.65	472.23	568.37	44.00	382.00
Cost/unit	1517.50	598.90	799.25	251.85	1929.80

Customer Codes:

A = Army AF = Air Force MC = Marine Corps N = Navy
DSA = Defense Security Assistance OFA = Other Federal Agencies
NFA = Non-Federal Agencies

FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Actuator

	1979	1980	1981	1982	1983
Inventory Price	$1348	$1348	$1348	$1348	$1348
Customer	AF	AF	AF	AF	AF
Dir. Civ. Labor Production Cost	902	271	1065	1065	2267
Dir. Civ. Labor Production Hours	84	25	88	83	156
Dir. Civ. Labor Other Cost	0	0	0	0	0
Dir. Civ. Labor Other Hours	0	0	0	0	0
Dir. Matl. Cost Funded	18590	43	2926	7874	37996
Dir. Matl.-Investment Unfunded	0	0	0	0	0
Dir. Matl.-Exchanges Unfunded	0	0	0	0	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Opns. Ovhd. Cost Funded	543	185	625	682	1210
Opns. Ovhd Cost Unfunded	39	13	43	49	157
G & A Expense Funded	833	248	1028	1242	2349
G & A Expense Unfunded	62	17	79	98	182
TOTAL COST	20969	777	5766	11002	44161
Prod. Qty. Compl.	11	5	17	16	25
Dir. Lab. Hrs/unit	7.6	5.0	5.1	5.1	6.2
Dir. Matl./unit	1690.00	8.60	172.11	492.12	1519.84
Cost/unit	1906.27	155.40	339.17	687.62	1766.44

Customer Codes:

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FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Calibration

	1979	1980	1981	1982	1983
Inventory Price	$0	$0	$0	$0	N
Customer	OFA,NFA,N	N	N	N	
Dir. Civ. Labor					0
Production Cost	11051	1577	2053	1498	
Dir. Civ. Labor					
Production Hours	848	118	123	93	D
Dir. Civ. Labor					
Other Cost	2286	0	39	0	A
Dir. Civ. Labor					
Other Hours	158	0	3	0	T
Dir. Matl. Cost					
Funded	177	32	19	140	A
Dir. Matl.-Investment					
Unfunded	0	0	0	0	
Dir. Matl.-Exchanges					A
Unfunded	0	0	0	0	
Dir. Matl.-Mod. Kits					V
Unfunded	0	0	0	0	
Other Dir. Costs					A
Funded	18386	0	0	0	
Opns. Ovhd. Cost					I
Funded	6734	1009	1262	1048	
Opns. Ovhd Cost					L
Unfunded	620	23	189	87	
G & A Expense					A
Funded	10942	1365	1287	1111	
G & A Expense					B
Unfunded	741	27	80	82	
					L
TOTAL COST	50937	4033	4849	3966	
					E
Prod. Qty. Compl.	0	0	0	1	
Dir. Lab. Hrs/unit				93	
Dir. Matl./unit				140.00	
Cost/unit				3966.00	

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FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Calibration

	1979	1980	1981	1982	1980
Inventory Price	$0	$0	$0	$0	$0
Customer	N	N	A,OFA,N	N	N
Dir. Civ. Labor Production Cost	2172	0	4852	2462	561
Dir. Civ. Labor Production Hours	168	0	331	173	47
Dir. Civ. Labor Other Cost	16246	140	547	969	0
Dir. Civ. Labor Other Hours	1647	10	32	52	0
Dir. Matl. Cost Funded	16953	0	116	290	228
Dir. Matl.-Investment Unfunded	0	0	0	0	0
Dir. Matl.-Exchanges Unfunded	0	0	0	0	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Other Dir. Costs Funded	82	0	370	0	0
Opns. Ovhd. Cost Funded	1209	0	2478	1295	412
Opns. Ovhd Cost Unfunded	90	0	184	101	30
G & A Expense Funded	16408	107	3721	3443	698
G & A Expense Unfunded	911	8	352	241	57
TOTAL COST	54071	255	12628	8801	1986
Prod. Qty. Compl.	20	0	35	22	2
Dir. Lab. Hrs/unit	8.4		9.4	7.8	23.5
Dir. Matl./unit	847.65		3.31	13.18	114.00
Cost/unit	2703.55		360.57	400.04	993.00

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FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Clock

	1979	1980	1981	1982	1983
Inventory Price	$99	$99	$99	$99	$616
Customer	N	N	N	N	N
Dir. Civ. Labor Production Cost	78	965	1529	1548	1599
Dir. Civ. Labor Production Hours	7	77	184	189	98
Dir. Civ. Labor Other Cost	0	0	1	0	0
Dir. Civ. Labor Other Hours	0	0	1	0	0
Dir. Matl. Cost Funded	0	623	77	0	0
Dir. Matl.-Investment Unfunded	0	0	0	0	0
Dir. Matl.-Exchanges Unfunded	0	0	0	0	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Opns. Ovhd. Cost Funded	58	704	1072	1198	1410
Opns. Ovhd Cost Unfunded	5	15	93	74	20
G & A Expense Funded	71	870	1069	1321	1503
G & A Expense Unfunded	4	17	66	52	27
TOTAL COST	216	3194	3907	4193	4559
Prod. Qty. Compl.	1	25	33	69	27
Dir. Lab. Hrs/unit	7.0	3.0	3.1	1.5	3.6
Dir. Matl./unit	0.00	24.92	2.33	0.00	0.00
Cost/unit	216.00	127.76	118.39	60.76	168.85

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FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Clock

	1979	1980	1981	1982	1983
Inventory Price	N	N	N	$99	$99
Customer				N	N
Dir. Civ. Labor	D	D	D		
Production Cost				988	468
Dir. Civ. Labor					
Production Hours	D	D	D	68	32
Dir. Civ. Labor					
Other Cost	A	A	A	0	0
Dir. Civ. Labor					
Other Hours	T	T	T	0	0
Dir. Matl. Cost					
Funded	A	A	A	0	0
Dir. Matl.-Investment					
Unfunded				0	0
Dir. Matl.-Exchanges	A	A	A		
Unfunded				0	0
Dir. Matl.-Mod. Kits	V	V	V		
Unfunded				0	0
Opns. Ovhd. Cost	A	A	A		
Funded				541	233
Opns. Ovhd Cost	I	I	I		
Unfunded				36	19
G & A Expense	L	L	L		
Funded				1048	587
G & A Expense	A	A	A		
Unfunded				70	38
	B	B	B		
TOTAL COST				2683	1265
	L	L	L		
Prod. Qty. Compl.				18	3
Dir. Lab. Hrs/unit	E	E	E	3.7	10.6
Dir. Matl./unit				0.00	0.00
Cost/unit				149.05	421.66

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FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Container

	1979	1980	1981	1982	1983
Inventory Price	N	$388	$893	$318	N
Customer		N	N	N	
Dir. Civ. Labor	D				D
Production Cost		33	87	1093	
Dir. Civ. Labor					
Production Hours	D	4	8	95	D
Dir. Civ. Labor					
Other Cost	A	0	0	0	A
Dir. Civ. Labor					
Other Hours	T	0	0	0	T
Dir. Matl. Cost					
Funded	A	0	46	94	A
Dir. Matl.-Investment					
Unfunded		0	0	0	
Dir. Matl.-Exchanges	A				A
Unfunded		0	0	0	
Dir. Matl.-Mod. Kits	V				V
Unfunded		0	0	0	
Opns. Ovhd. Cost	A				A
Funded		30	66	867	
Opns. Ovhd Cost	I				I
Unfunded		1	4	17	
G & A Expense	L				L
Funded		44	80	1249	
G & A Expense	A				A
Unfunded		1	4	19	
	B				B
TOTAL COST		109	287	3339	
	L				L
Prod. Qty. Compl.		1	2	26	
Dir. Lab. Hrs/unit	E	4.0	4.0	3.6	E
Dir. Matl./unit		0.00	23.00	3.61	
Cost/unit		109.00	143.50	128.42	

Customer Codes:

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FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Container

		1979	1980	1981	1982	1983
Inventory Price	N		$388	$893	$893	$298
Customer			N	N	N	N
Dir. Civ. Labor	D					
Production Cost			67	3881	3513	11706
Dir. Civ. Labor						
Production Hours	D		8	370	294	950
Dir. Civ. Labor						
Other Cost	A		0	0	0	0
Dir. Civ. Labor						
Other Hours	T		0	0	0	0
Dir. Matl. Cost						
Funded	A		0	156	39	39
Dir. Matl.-Investment						
Unfunded			0	0	0	0
Dir. Matl.-Exchanges	A					
Unfunded			0	0	0	0
Dir. Matl.-Mod. Kits	V					
Unfunded			0	0	0	0
Opns. Ovhd. Cost	A					
Funded			81	4137	3117	6817
Opns. Ovhd Cost	I					
Unfunded			3	116	119	448
G & A Expense	L					
Funded			86	4751	4586	14738
G & A Expense	A					
Unfunded			6	356	306	1111
	B					
TOTAL COST			243	13397	11600	36859
	L					
Prod. Qty. Compl.			1	83	71	294
Dir. Lab. Hrs/unit	E		8.0	4.4	4.1	3.2
Dir. Matl./unit			0.00	1.87	0.54	0.13
Cost/unit			243.00	161.40	164.50	125.37

Customer Codes:

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FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Converter

	1979	1980	1981	1982	1983
Inventory Price	$454/717	$717	$454/717	$454/717	$454/717
Customer	OFA,N	DSA,N	DSA,N	DSA,N	DSA,N
Dir. Civ. Labor Production Cost	44565	41496	59440	161190	128581
Dir. Civ. Labor Production Hours	3929	3682	4883	13762	10753
Dir. Civ. Labor Other Cost	22	0	94	0	1
Dir. Civ. Labor Other Hours	2	0	8	0	1
Dir. Matl. Cost Funded	113969	60894	175458	429964	452459
Dir. Matl.-Investment Unfunded	0	0	0	0	0
Dir. Matl.-Exchanges Unfunded	884	4549	2152	0	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Opns. Ovhd. Cost Funded	29302	29487	41265	131233	117439
Opns. Ovhd Cost Unfunded	1555	1214	1847	4408	2885
G & A Expense Funded	43191	42935	52774	169378	155589
G & A Expense Unfunded	2375	1666	2581	8398	2422
TOTAL COST	235863	182241	335603	904571	858496
Prod. Qty. Compl.	815	379	512	3285	2278
Dir. Lab. Hrs/unit	4.8	9.7	9.5	4.1	4.7
Dir. Matl./unit	139.83	160.67	342.67	130.88	198.62
Cost/unit	289.40	480.84	655.47	275.36	376.86

Customer Codes:

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DSA = Defense Security Assistance OFA = Other Federal Agencies
NFA = Non-Federal Agencies

FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Converter

	1979	1980	1981	1982	1983
Inventory Price	N	N	$717	$717	$717
Customer			N	N	N
Dir. Civ. Labor	D	D			
Production Cost			4856	14891	18206
Dir. Civ. Labor					
Production Hours	D	D	359	1013	1273
Dir. Civ. Labor					
Other Cost	A	A	0	0	0
Dir. Civ. Labor					
Other Hours	T	T	0	0	0
Dir. Matl. Cost					
Funded	A	A	1172	1287	2268
Dir. Matl.-Investment					
Unfunded			1435	7173	4304
Dir. Matl.-Exchanges	A	A			
Unfunded			0	0	0
Dir. Matl.-Mod. Kits	V	V			
Unfunded			0	0	0
Opns. Ovhd. Cost	A	A			
Funded			2835	7865	9389
Opns. Ovhd Cost	I	I			
Unfunded			196	588	977
G & A Expense	L	L			
Funded			4645	14795	19483
G & A Expense	A	A			
Unfunded			359	1064	1414
	B	B			
TOTAL COST			15498	46863	56041
	L	L			
Prod. Qty. Compl.			29	90	44
Dir. Lab. Hrs/unit	E	E	12.3	11.2	28.9
Dir. Matl./unit			40.41	14.30	51.54
Cost/unit			534.41	520.70	1273.65

Customer Codes:

A = Army AF = Air Force MC = Marine Corps N = Navy
DSA = Defense Security Assistance OFA = Other Federal Agencies
NFA = Non-Federal Agencies

FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Indicator

	1979	1980	1981	1982	1983
Inventory Price	$1050	$1050	$1050	$1050	$1050
Customer	OFA,N	DSA,N	N	N	DSA,N
Dir. Civ. Labor Production Cost	23693	10419	25532	36894	25344
Dir. Civ. Labor Production Hours	2125	787	1884	2430	1594
Dir. Civ. Labor Other Cost	0	0	0	0	0
Dir. Civ. Labor Other Hours	0	0	0	0	0
Dir. Matl. Cost Funded	37258	29327	53658	42436	45244
Dir. Matl.-Investment Unfunded	0	0	0	0	0
Dir. Matl.-Exchanges Unfunded	0	0	0	0	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Opns. Ovhd. Cost Funded	16916	7488	20238	27210	21942
Opns. Ovhd Cost Unfunded	1542	663	1012	2284	301
G & A Expense Funded	23364	9837	22318	28886	23846
G & A Expense Unfunded	1291	467	789	1474	424
TOTAL COST	104864	57401	123547	139104	116301
Prod. Qty. Compl.	186	167	102	189	134
Dir. Lab. Hrs/unit	11.4	4.7	18.4	12.8	11.8
Dir. Matl./unit	200.31	175.61	526.05	224.52	337.64
Cost/unit	559.48	343.71	1211.24	736.00	867.91

Customer Codes:

A = Army AF = Air Force MC = Marine Corps N = Navy
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FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Indicator

	1979	1980	1981	1982	1983
Inventory Price	N	N	$1050	$1050	$6230
Customer			N	N	N
Dir. Civ. Labor	D	D			
Production Cost			749	4883	2176
Dir. Civ. Labor					
Production Hours	D	D	45	334	132
Dir. Civ. Labor					
Other Cost	A	A	10	25	0
Dir. Civ. Labor					
Other Hours	T	T	2	2	0
Dir. Matl. Cost					
Funded	A	A	0	2423	2292
Dir. Matl.-Investment					
Unfunded			0	0	0
Dir. Matl.-Exchanges	A	A			
Unfunded			0	0	0
Dir. Matl.-Mod. Kits	V	V			
Unfunded			0	0	0
Opns. Ovhd. Cost	A	A			
Funded			368	2746	999
Opns. Ovhd Cost	I	I			
Unfunded			26	202	115
G & A Expense	L	L			
Funded			595	4878	2891
G & A Expense	A	A			
Unfunded			47	364	158
	B	B			
TOTAL COST			1795	15521	7831
	L	L			
Prod. Qty. Compl.			3	31	13
Dir. Lab. Hrs/unit	E	E	15.0	10.7	10.1
Dir. Matl./unit			0.00	78.16	176.30
Cost/unit			598.33	500.67	602.30

Customer Codes:

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FY79-FY83 SELECTED DATA RECORDS
NARF Jacksonville

Item Nomenclature: Navy Activity Other

	1979	1980	1981	1982	1983
Inventory Price	$0	$0	$0	$0	$0
Customer	N	N	OFA,N	DSA,NFA,N	NFA,N
Dir. Civ. Labor Production Cost	22117	62931	92879	36441	80124
Dir. Civ. Labor Production Hours	1833	4634	6485	2816	5949
Dir. Civ. Labor Other Cost	12724	8438	23671	44243	219322
Dir. Civ. Labor Other Hours	1027	674	1671	3460	15589
Dir. Matl. Cost Funded	32665	20596	68117	180596	53381
Dir. Matl.-Investment Unfunded	0	0	0	0	1870
Dir. Matl.-Exchanges Unfunded	0	0	0	0	15954
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Other Dir. Costs Funded	511	11729	7799	338	3591
Opns. Ovhd. Cost Funded	14353	41588	55621	28719	67598
Opns. Ovhd Cost Unfunded	1156	3876	2630	1395	1134
G & A Expense Funded	31397	63213	93497	75847	325425
G & A Expense Unfunded	1943	3854	3851	5028	7234
TOTAL COST	116866	214625	347265	372607	775633
Prod. Qty. Compl.	0	3	0	50	33
Dir. Lab. Hrs/unit		1544.6		56.3	180.2
Dir. Matl./unit		6865.33		3611.92	1617.60
Cost/unit		71541.66		7452.14	23504.03

Customer Codes:

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DSA = Defense Security Assistance OFA = Other Federal Agencies
NFA = Non-Federal Agencies

FY79-FY83 SELECTED DATA RECORDS
NARF Pensacola

Item Nomenclature: Navy Activity Other

	1979	1980	1981	1982	1983
Inventory Price	$0	$0	$0	$0	$0
Customer	N	N	MC,N	NFA,N	N
Dir. Civ. Labor Production Cost	73354	21050	36112	190719	25739
Dir. Civ. Labor Production Hours	5930	1844	2918	13486	1876
Dir. Civ. Labor Other Cost	6173	8829	22982	62408	55644
Dir. Civ. Labor Other Hours	512	714	1657	4897	3998
Dir. Matl. Cost Funded	14780	5989	16987	314389	189781
Dir. Matl.-Investment Unfunded	0	8347	0	25809	0
Dir. Matl.-Exchanges Unfunded	0	0	0	0	0
Dir. Matl.-Mod. Kits Unfunded	0	0	0	0	0
Other Dir. Costs Funded	17536	412	0	68956	42628
Opns. Ovhd. Cost Funded	35547	15940	30713	122954	23048
Opns. Ovhd Cost Unfunded	1432	1846	1459	2775	1211
G & A Expense Funded	63468	36937	59756	260804	71284
G & A Expense Unfunded	4304	2586	4278	20104	4704
TOTAL COST	216594	101056	172207	1068838	414039
Prod. Qty. Compl.	14	32	32	6	1
Dir. Lab. Hrs/unit	423.5	57.6	91.1	2247.6	1876.0
Dir. Matl./unit	1055.71	184.65	530.84	52384.83	189781.00
Cost/unit	15471.00	3158.00	5381.46	178139.66	414039.00

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Department of Administrative Sciences
Naval Postgraduate School
Monterey, California 93943

11. LCDR Joseph L. Burnett, USN — 2
Office of the Chief of Naval Operations
(OP-514D)
Pentagon
Washington, D.C. 20350

12. Mr. C. L. Burnett — 1
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13. CDR W. D. Vandivort — 6
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